

A good time for a fire? A note on some effects of wildfire on a Grassy White Box Woodland

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Abstract

A remnant stand of Grassy White Box Woodland, containing trees that had been monitored for abundance of reproductive structures since 2000, was burnt by wildfire in late 2006. Very little seed was present in the aerial seedbank of White Box at the time of the fire and, due to the destruction of the newly-forming capsules, seed is likely to be in short supply in the near future. Seedling recruitment of White Box was minimal after the fire. However, the existing woodland structure is likely to be maintained as most of the fire-damaged trees regenerated vegetatively. Most of the other native perennials, woody and herbaceous, regenerated vegetatively, but exotics – mostly annuals – increased markedly via seedling recruitment during the year following the fire. (*The Victorian Naturalist* 125 (6), 2008, 160–165)

Keywords: Grassy White Box Woodland, wildfire, reproductive structures, recovery, fire damage

Introduction

Grassy White Box *Eucalyptus albens*¹ Woodlands (Prober and Thiele 1993) extend from southern Queensland through New South Wales (NSW) to north-central Victoria. Scattered occurrences are also present in western Victoria, the Snowy River area and the southern Flinders Ranges of South Australia. It is listed nationally as an endangered ecological community under the *Environment Protection and Biodiversity Act 1999*. Stands with intact structure and ground-storey composition are rare (Prober 1996). Patchy fires may have played a role in maintaining these woodlands in their original state (Allcock *et al.* 1999). Most grassy (rather than shrubby) woodlands are located on relatively fertile soils (a primary reason for their demise since European settlement) where fires or other disturbances that remove accumulated biomass and create regeneration niches are necessary for maintaining groundstorey diversity (Lunt *et al.* 2007). Fire is often considered a prerequisite for eucalypt recruitment in humid forests due to its creation of a competition-free, nutrient-enriched seedbed and, via canopy scorch, synchronous fall of seed of sufficient quantity to satiate seed predators (Florence 1996).

Though fire can assist seedling recruitment of woodland eucalypts under certain

conditions (e.g. Semple and Koen 2001), it is not necessary in subhumid environments where, for example, regeneration often occurs following the breaking of a drought (Curtis 1990), or suppressed seedlings are released following a run of seasons with above-average rainfall (Jacobs 1955).

A small stand of Grassy White Box Woodland, 6 km south-west of Molong in the Central Western region of NSW, extended across three land tenures: freehold, crown reserve ('Pinecliffe Reserve') and road reserve. Despite some past tree felling (Fig. 1a) and recent exotic tree planting (Fig. 2b) on the freehold, the stand was relatively intact, i.e. trees were at woodland spacings with mixed age-classes and the groundstorey contained many of the native perennial grasses and forbs that would be expected in this vegetation type. Exotic annuals were present but not dominant – a common occurrence in most remnants of White Box woodland in the southern portion of its range (Prober 1996). Wildfire swept through the stand in November 2006 and consumed virtually all of the above-ground herbage and much of the small woody material present (Figs. 1c and 2c). Canopies of many of the trees were consumed suggesting that 'crown fire' conditions were experienced.



Fig. 1. Part of the grassy White Box community near Molong (NSW) as it appeared on the freehold area in (a) March 1994 [64/6]; (b) February 2003 during drought conditions [206/12]; (c) early April 2007 four months after the fire [252/18].

As part of a larger project (currently being prepared for publication), 13 White Box trees on a 15 x 150 m section of the roadside at Molong had been monitored for the seasonal abundance of reproductive structures from March 2000 to November 2007. An abundant flowering in 2006, the first since 2001, was just replenishing the declining aerial seedbank with immature capsules when the fire occurred. As seed

Fig. 2. Part of the monitored (road reserve, left hand side of the fence) and unmonitored stand of White Box as it appeared in (a) April 2000 [169A/25]; (b) February 2003 during refencing and following planting of exotics (protected by drums) in the adjacent freehold [206/11]; (c) early April 2007 four months after the fire. Note the absence of *Callitris endlicheri* to the right of the fenceline [252/20].

from more than one flowering may be present in the canopy of White Box trees and seed may be held in capsules for up to 3 years (Semple *et al.* 2007), only seed from a minor flowering of 2004 was likely to have been present when the fire occurred. Seed in the newly-forming capsules was

unlikely to have been viable as a period of at least 6 months after flowering is usually necessary for seed maturation in temperate eucalypts (Boland *et al.* 1980) and possibly longer for White Box (Burrows 1995).

Following the fire, opportunity was taken to continue monitoring the White Box trees and to document the recovery of other species in the stand.

Methods

The extent of fire damage (e.g. canopy scorch, basal burn) to each of the monitored White Box trees was noted. The abundance of reproductive structures (buds, flowers, capsules) was assessed with binoculars as previously, using a 6-point scale (0, nil, to 5, maximum possible; with 3 representing 'obvious and dispersed across most of the canopy'), at approximately 2-monthly intervals, from November 2006 until March 2008. Regenerative mechanisms of woody species were noted and in one case, a regenerative structure was excavated. Any seedlings of White Box were tagged. Recovery of herbaceous species was assessed qualitatively during the early part of the above activities.

Results

White Box

Three of the monitored roadside trees appeared unaffected by the fire, three suffered minor scorch (<30% of canopy

affected) and the remainder had various levels of lower trunk damage and up to 100% canopy scorch. Immature capsules in scorched parts of White Box canopies ripened prematurely and took on a dull light brown colour unlike that of normal mature capsules. After the fire, most of the trees, even those that had experienced minimal canopy scorch, shed some of their crop of (immature and more mature) capsules but, as shown in Fig. 3, this was a normal occurrence following capsule formation.

Any mature capsules present would have shed seed shortly after the canopy was scorched or burnt but, as noted above, such capsules were few and little seed was probably shed. This was reflected in the low numbers of new seedlings found on the monitored part of the roadside: 12 (10 evident after a search in April 2007 followed by another two smaller ones later in the year) and all probably from the seed of one or two trees. Only one of the seedlings died during the summer of 2007/08. Apart from the few undamaged trees, mainly on the roadside, the potential seed crop from the 2006 flowering would have been destroyed.

New floral buds normally become evident in November/December but none was evident in 2006 – probably a consequence of the previous season's abundant flowering rather than of the fire *per se*. However,

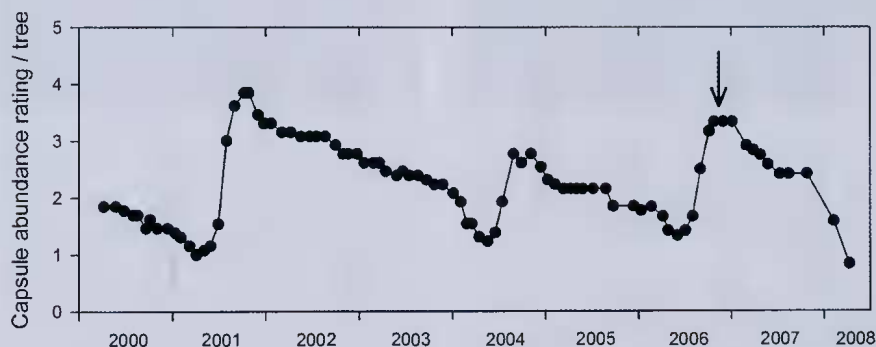


Fig. 3. Mean ($n = 13$ until January 2006 and 12 thereafter) capsule abundance rating (0–5, see text) in the monitored roadside stand of White Box from March 2000 to March 2008. Time of wildfire is indicated by arrow. Note that no distinction is made between capsules of different maturities. Most of the capsules present at the time of the fire were immature and after the fire about half of the capsules were dead (see text).

Table 1. Regenerating native species in a Grassy White Box Woodland in Central Western NSW, approximately 5 months after wildfire. Virtually all regeneration was vegetative – from stems and/or below-ground structures. * = Kurrajong regenerated from buds on stems (larger trees), basal buds (smaller trees) and from swollen roots (small trees, Fig. 4).

Trees and shrubs

Hickory Wattle *Acacia implexa*
Kurrajong *Brachychiton populneus**
White Box *Eucalyptus albens*

Hill Red Gum *Eucalyptus dealbata*
Grey Guinea Flower *Hibbertia obtusifolia*

Herbaceous monocotyledons and ferns

Rock Fern *Cheilanthes* sp.
Purple Wiregrass *Aristida ramosa*
Wallaby Grasses *Austrodanthonia* spp.
Redgrass *Bothriochloa ?macra*
Barbed-wire Grass *Cymbopogon refractus*
Cotton Panic *Digitaria brownii*
Silky Browntop *Eulalia aurea*
Microlaena *Microlaena stipoides*

Pinrush *Juncus* sp.
Wattle Mat-rush *Lomandra filiformis*
Smooth Flax Lily *Dianella longifolia*
Black-anthered Flax Lily *Dianella revoluta*
Choeolate Lily *Arthropodium* sp.
Bulbine Lily *Bulbine bulbosa*
Yellow Rush Lily *Tricoryne elatior*

Herbaceous dicotyledons

Sheep's Burr *Acaena* sp.
Joyweed *Alternanthera* sp.
Common Woodruff *Asperula conferta*
Yellow Burr-daisy *Calotis lappulacea*
Tiek Trefoil *Desmodium* sp.
Kidneyweed *Dichondra repens*

Climbing Saltbush *Einadia* sp.
Stinking Pennywort *Hydrocotyle laxiflora*
Variable Plantain *Plantago varia*
Solenogyne *Solenogyne* sp.
New Holland Daisy *Vittadinia* sp.
Bluebells *Wahlenbergia* spp.

three trees (two apparently undamaged and one with minor basal and foliage damage) produced some buds in March 2007 but these did not produce flowers until autumn 2008. [Bud production prior to November was unusual but had been recorded in a few trees in this stand previously and, as in this case, none produced flowers until the following year (Semple and Koen, unpubl. data).]

Surprisingly, none of the trees produced buds at the normal time in the following season (i.e. November/December 2007) but as before, some trees (four with the likelihood of another two – none of which was severely affected by the fire) produced some buds in autumn 2008 – though on previous experience, these will yield only a few flowers in 2009. Whether or not this apparent shift in bud production from late in the year to early in the year was due to the fire (or high temperatures associated with it), or to other factors such as prevailing dry conditions or the ongoing increase in average temperatures ('global warming'), is unknown. In any case, the aerial seedbank is unlikely to be partially replenished until 2009 at the earliest.

None of the monitored trees was killed by the fire and this probably also applied to

those in the unmonitored areas. Small trees regenerated from lignotubers or basal epicormic shoots as did those trees whose trunks were destroyed. Less severely damaged trees regenerated from epicormic buds.

Other woody species

Apart from Black Cypress Pine *Callitris endlicheri* (compare Figs. 2a and 2c) and a Ballart *Exocarpos* sp., none of the woody plants in or near the monitored area appeared to have been killed by the fire. Some possible seedlings of Kurrajong *Brachychiton populneus* and Hickory Wattle *Acacia implexa* were present, but most native species regenerated vegetatively (Table 1, Fig. 4).

Herbaceous species

Much of the early regeneration was vegetative (Table 1). Storms in the summer of 2006/07 promoted limited germination of mainly exotic species but, by mid April 2007, vegetative cover was very low (Fig. 1c) – a probable consequence of the patchy distribution of native perennials. Late autumn rains in 2007 resulted in further germinations, mainly of exotics (particularly *Anagallis*, *Avena*, *Lolium*, *Trifolium* spp.) and groundcover increased considerably. When last visited in March 2008,



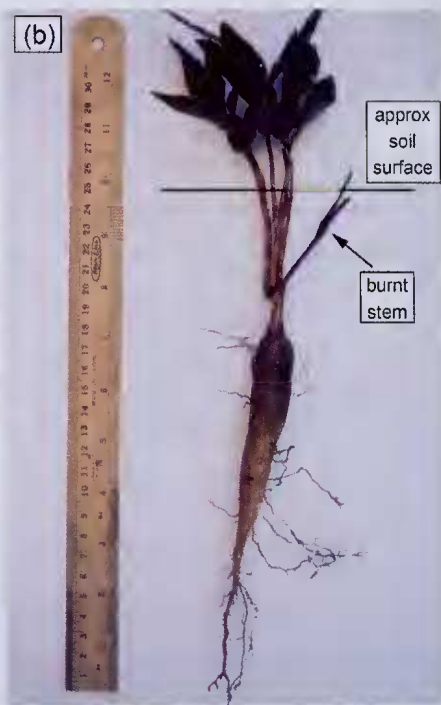
Fig. 4. Small Kurrajong that produced multiple stems from a swollen root after the original stem had been burnt 10 months previously: (a) prior to excavation [262/25] and (b) after excavation [263/17].

Feather-top Rhodes Grass *Chloris ventricosa*, an exotic perennial encroacher from the immediate roadside, was present over much of the monitored area – a probable consequence of rainfall in November/December 2007.

Discussion and Conclusions

Despite the death of localised Black Cypress Pine and Ballart (which will probably regenerate from seed at some future time and still exist in unburnt patches), it was unlikely that any species, woody or herbaceous, was lost from the stand as a result of the fire. None of the roadside eucalypts, White Box and Hill Red Gum *Eucalyptus dealbata*, was killed and despite the stacking of fallen trees in part of the burnt area (Fig. 1c), this would probably be the case in the adjacent freehold. Assuming that lignotuberous (not fully evident in Fig. 1c) and other regeneration is allowed to survive as is required under NSW's *Native Vegetation Act 2003*, the structure of the woodland would eventually return to the pre-fire condition even without seedling regeneration.

However, if seed had been abundant in the canopy and the wildfire had promoted synchronous seed fall and massive seedling recruitment, a denser stand of trees, i.e. of forest structure, may have resulted. The occasional occurrence of stands of typically-woodland eucalypts with open forest structure elsewhere sug-



gests that their origin may be due to past crown fires rather than to the 'patchy' and presumably less intense fires that Allcock *et al.* (1999) suggested were responsible for the maintenance of grassy woodlands.

A good time for a fire? From a conservation perspective: probably not, at least for a fire of the intensity that occurred. Due to the low abundance of mature seed in the canopy of White Box, the fire was not conducive to extensive seedling recruitment. Potential replenishment of the canopy seedbank was destroyed and is unlikely to be replaced for some years. Woodland structure will take many years to recover (though the numerous standing and fallen dead tree trunks may ultimately have some habitat benefits). Although many native herbaceous perennials regenerated vegetatively, albeit patchily, shortly after the fire, the large areas of bare ground were conducive to extensive seedling recruitment of exotic annuals following late autumn rains. This is likely to have an adverse effect on current and future seedling recruitment of native species.

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Note

¹ Botanical nomenclature follows that of Harden (1990-93).

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Water Rats as predators of Little Penguins

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Abstract

Water Rats are widely distributed throughout a variety of habitats and are known to be opportunistic predators. Their occupation in coastal areas often occurs within Little Penguin colonies, but interactions between the two species have not previously been reported. Given that Water Rats prey on other bird species, it is likely that they will also take young or weak Little Penguins. Here the case of a Little Penguin chick death that has been attributed to an attack by a Water Rat is reported. (*The Victorian Naturalist* **125** (6), 2008, 165-168).

Keywords: Water Rat, penguin, predation

Introduction

The native Water Rat *Hydromys chrysogaster* is an opportunistic predator, known to eat insects, crustaceans, fish, spiders, frogs, bats, shellfish, turtles, birds, carrion and some plant material (Woollard *et al.* 1978; Dickman *et al.* 2000). Widely distributed throughout Australia, Water Rats are considered common in large cities (Menkhorst and Knight 2001), occupying a variety of freshwater, estuarine and marine environments (Scebeck and Menkhorst 2000). Often inhabitants of coastal areas, the range of the Water Rat sometimes over-

laps with that of sea-birds such as Silver Gulls *Larus novaehollandiae*, Short-tailed Shearwaters *Puffinus tenuirostris* and Little Penguins *Eudyptula minor* (Woollard *et al.* 1978; Wilson and Duffell 2005). Although Water Rats have previously been reported taking shearwaters, ducks, domestic fowl and a number of waterfowl (Woollard *et al.* 1978), there has been no report of them preying on Little Penguins.

Water Rats are known to live within the Little Penguin colonies at Phillip Island (P Dann, pers. comm.), Cat Island (Wilson and